Point-Of-Care-Technology in the Emergency Department

Enhancing Process Efficiency and Patient Safety

CENTER FOR HOSPITAL MANAGEMENT

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Context
Increasing Demand for Emergency Services

In German hospitals, emergency departments (ED) suffer from "crowding effects" caused by a yearly increase in patient numbers of 7% and due to limited resources pertaining to medical staff and supporting devices. Up to 18% of the ED patients suffer from "non-specific thoracic pain". 70% of this group need two troponin tests (cTn) for appropriate treatment. However, the average length of stay (ALOS) of acute coronary syndrome (ACS) patients varies between 4 and 7 hours. One reason is the high variation in the turn-around-time (TAT) between collecting the blood sample and the availability of the test results. This TAT fluctuates between 42 and 121 minutes (average TAT = 73 minutes): a non-controlled process with high variance and blockade of ED resources.

Methods
Before-After-Comparison: Central Lab vs. POCT Setting

A randomized single-center trial (see figure 1) was conducted at a university-affiliated hospital with 68,754 ED patient visits per year. In the first study phase, cTn measurement of patients with suspicion of NSTE-ACS was performed in a central laboratory setting (62 patients). During the first week after having implemented a POCT-solution for cTn, another 46 patients were observed in terms of therapeutic turn-around-time (tTAT) and LOS in the ED (second phase). Six months later, the third phase including 48 patients took place. Again, tTAT and LOS were measured and learning curve effects were analyzed. To compare the central laboratory and the POCT-setting, ED-staff who performed POCT (26 people) were queried on different items (e.g. satisfaction with workflow effectiveness; patient risks) in order to identify resistance to change and the status of acceptance of the POCT-setting in all three phases of the study. Furthermore, the economic relevance of a POCT investment was proved based on a calculatory approach in combination with a resource scheduling and smoothing program.

Results
POCT pays off from a clinical and economic point of view

POCT was associated with an accelerated availability of cTn test results (lab: 70 min; POCT: 14 min), a shorter time to physician notification (92 min; 22 min), a shorter time to clinical decision-making (110 min; 40 min) and a reduced ALOS by 70 minutes (see figure 2). Furthermore, calculatory cost savings of 178 Euro per day could be verified. Also, there was an exoneration of ED capacity equal to the service capacity needed for seven patients (see figure 3). The resource levelling effect was the economic value of an avoided investment of 138.000 Euro.

From the staff's point of view, a POCT environment is assessed to be safer, more effective and convenient to work in compared to a central lab setting. 35% of the users estimated the efficiency of the troponin test process as "highly satisfying" in a central lab test setting. In contrast, 91% of the users evaluated this process as "highly satisfying" in a POCT-driven organization (see figure 2).

Discussion

POCT for cTn measurement has clinical relevance for ED patients with "non-specific thoracic pain" especially for high-risk patients with a low suspicion of ACS ("late responders"). POCT contributes to reducing "crowding effects", containing process costs and increasing patient satisfaction because of reduced ED waiting times. Especially ACS patients benefit from a POCT setting because of a more precise and faster diagnosis. A POCT setting for cTn measurement is significantly more acceptable to the ED staff than in a central lab setting, because it is felt to be a self-controlled process.

A change of setting from central lab testing to POCT in fact means a shift of workload from lab to the ED staff. The employees' motivation to use a new implemented technology as a part of a new workflow organization is crucial to achieve a high level of effectiveness and efficiency. Its level could be leveraged if additional parameters critical to therapy are measured by POCT (e.g. CRP, DD, CK-MB). In addition, change management efforts are needed. And it is highly recommended to shift responsibility for periodic calibration of POCT devices to central lab staff in order to disburden ED staff from non-clinical duties.

Study Design

The study design meets the requirements of RCT standards (Randomized Controlled Trial).

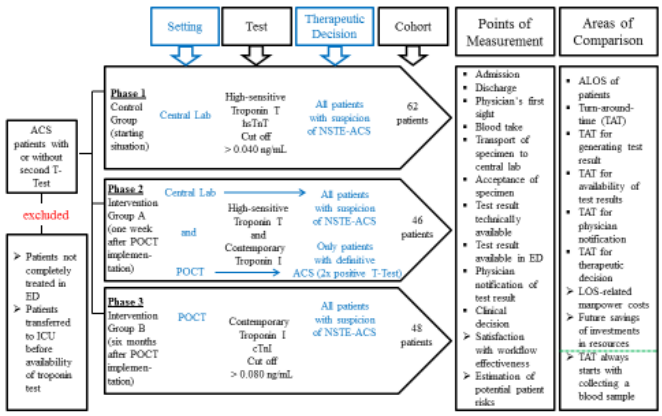

Figure 1: Study Design

Clinical Decision-making in the ED

6 months after implementation of the POCT setting the therapeutic turn-around-time could significantly be reduced and staff satisfaction has increased.

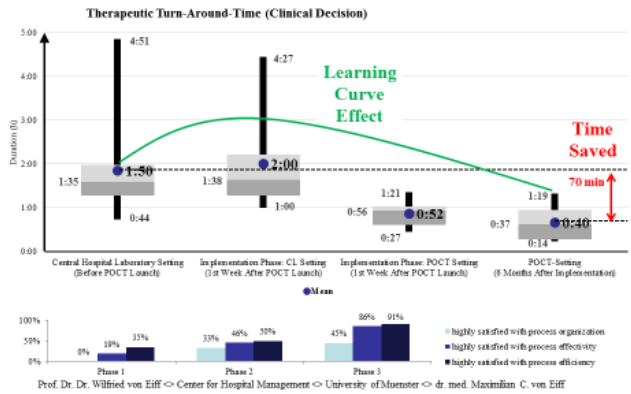

Figure 2: Results of the study

Capacity Utilization in the ED

In a full-in-use POCT setting there are up to seven patients less in the system (time frame 9 hours).

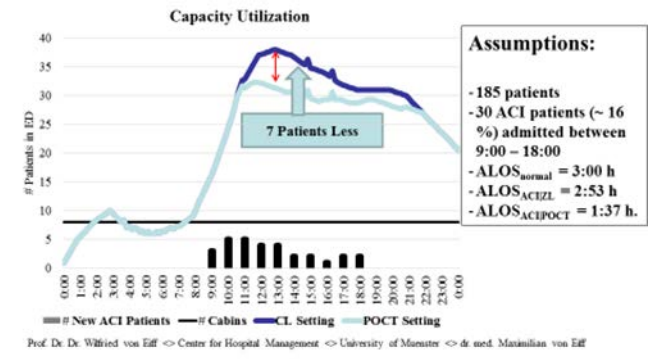

Figure 3: Improved capacity utilization by POCT setting: The exoneration of ED-capacity equals with service capacity needed for 7 patients.

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